UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/786,856	02/24/2004	Fuyun Ling	010104C1	3630

23696 7590 02/15/2008

QUALCOMM INCORPORATED
5775 MOREHOUSE DR.
SAN DIEGO, CA 92121

EXAMINER	
PHU, PHUONG M	
ART UNIT	**PAPER NUMBER**
2611	

NOTIFICATION DATE	DELIVERY MODE
02/15/2008	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

us-docketing@qualcomm.com
kascanla@qualcomm.com
nanm@qualcomm.com

Office Action Summary	Application No.	Applicant(s)	
	10/786,856	LING ET AL.	
	Examiner	Art Unit	
	Phuong Phu	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 January 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *9-13,15-21,23-29,31 and 32* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *9,11-13,15-17,19-21,23-25,27-29,31 and 32* is/are rejected.

7)☒ Claim(s) *10,18 and 26* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *10/2/07*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This Office Action is responsive to the RCE and Amendment filed on 1/7/08. Accordingly, claims 9-13, 15-21, 23-29, 31 and 32 are currently pending; and claims 1-8, 14, 22 and 30 are canceled.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 9, 15, 16, 17, 23, 24, 25, 31 and 32 are rejected under 35 U.S.C. 102(e) as being anticipated by Ling et al (6,961,388), previously cited.

-Regarding claim 9, see figure 1, col. 3, line 24 to col. 4, line 67, col. 8, lines 8 to col. 9, line 35, Ling et al discloses a receiver unit (150) in a multiple-input multiple-output (MIMO) communication system (100), comprising:

at least one front end processor (145a,..., 145r) configured to receive at least one signal received via different spatial channels (see col. 3, line 66 col. 4, lines 67);

a MIMO processor (comprising (156)) coupled to the at least one front end processor and configured to provide estimates of at least some symbols in the at least one signal (see col. 4, lines 47-67); and

a channel quality estimator, (inherently included in the receiver unit, and coupled to the

MIMO processor via the receiver unit), configured to determine/estimate partial or full-CSI for transmission channels (see col. 18, lines 49-53), and to provide signal-to-noise and interference (SNR) information for one or more of the different spatial channels (see col. 8, lines 27-31), wherein the full-CSI includes sufficient characterization of the propagation path (i.e., amplitude and phase) between all pairs of transmit and receive antennas for each transmission channel "frequency subchannel" used for data transmission, and the partial-CSI includes SNR for the spatial channels (see col. 17, lines 4-8), the SNR being link characteristics of the transmission channels (see col. 1, lines 34-37, col. 6, lines 45-50), (the full-CSI or the partial-CSI considered here equivalent with the limitation "characteristics of a plurality of transmission channels used for data transmission"); and

a transmit data processor (inherently included in the receiver unit) configured to receive and process the SNR information for transmission on a reverse link from receiver unit (150) to a transmitter unit (110) (see col. 8, lines 22-31, col. 17, lines 7-8, col. 18, lines 49-53).

-Regarding claim 15, Ling et al teaches that the channel quality estimator is configurable to provide the SNR information based on a correlation matrix inversion (CCMI) processing (see col. 8, lines 32-36).

-Regarding claim 16, Ling et al teaches that the channel quality estimator is configured to provide the SNR information based on a minimum mean square error (MMSE) processing, (see col. 8, lines 32-36).

-Regarding claim 17, as similarly applied to claims 9, 15, 16 set forth above and herein incorporated, Ling et al discloses a receiver unit (150) (see figure 1) in a multiple-input multiple-output (MTMO) communication system (100), comprising:

means (154a,..., 154r) for receiving at least one signal received via different spatial channels;

means (providing (156) for providing estimates of at least some symbols in the at least one signal;

means, (inherently included in the receiver unit), for estimating partial or full-CSI as characteristics of a plurality of transmission channels for data transmission;

means (inherently included) for providing signal-to-noise and interference (SNR) information for one or more of the different spatial channels; and

a transmit data processor (inherently included) configured to receive and process the SNR information for transmission on a reverse link from receiver unit (150) to a transmitter unit (110).

-Claim 23 is rejected with similar reasons set forth for claim 15.

-Claim 24 is rejected with similar reasons set forth for claim 16.

-Regarding claim 25, as similarly applied to claims 9, 15, 16, 17, 23, 24 set forth above and herein incorporated, Ling et al discloses a method (see figure 1) for providing signal-to-noise and interference (SNR) for feedback in a wireless communication system, comprising:

procedure (154a,..., 154r) of receiving at least one signal received via different spatial channels;

procedure (comprising (156)) of providing estimates of at least some symbols in the at least one signal;

procedure (inherently included) for estimating partial or full-CSI as characteristics of a plurality of transmission channels used for data transmission;

procedure (inherently included) of providing signal-to-noise and interference (SNR) information for one or more of the different spatial channels; and

procedure (inherently included) of processing the SNR information for transmission on a reverse link from receiver unit (150) to a transmitter unit (110).

-Claim 31 is rejected with similar reasons set forth for claim 15.

-Claim 32 is rejected with similar reasons set forth for claim 16.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 11-13, 19-21 and 27-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ling et al.

-Regarding claim 11, Ling et al does not teaches that the channel quality estimator is configured to provide the SNR information based upon an average of SNR information over a plurality of subcarriers of an Orthogonal Frequency Division Multiplexed (OFDM) signal received at the receiver, as claimed.

However, Ling et al teaches that the channel quality estimator is configurable to provide SNR over sub-channels, the sub-channels being a plurality of subcarriers of an Orthogonal

Frequency Division Multiplexed (OFDM) signal received at the receiver, for transmission on a reverse link to the transmitter unit (110) (see col. 3, line 66 to col. 4, line34, col. 8, lines 28-31, col. 12, lines 14-23); and teaches that a channel interleaver (116) of the transmitter unit (110) performs interleaving for permitting data to be transmitted based on an average SNR for the sub-channels (see clol. 3, lines 55-60).

Since in Ling et al, the receiver (150) is capable of transmitting information on a reverse link to the transmitter (110), and Ling et al does not teach in detail how the average SNR for the sub-channels is obtained and provided to the transmitter (110), it would have been obvious for one skilled in the art to be able to select to implement Ling et al in such a way that the channel quality estimator is configurable to calculate to obtain an average of the SNR over sub-channels, for providing the average of SNR to the channel interleaver (116) of the transmitter unit (110).

With such the implementation, Ling et al teaches the channel quality estimator is configured to provide SNR information being the average of SNR over a plurality of subcarriers of an Orthogonal Frequency Division Multiplexed (OFDM) signal received at the receiver, or in another word, the channel quality estimator is configured to provide SNR information based upon the average of SNR information over a plurality of subcarriers of an Orthogonal Frequency Division Multiplexed (OFDM) signal received at the receiver, as claimed.

-Regarding claim 12, as similarly applied to claim 11, Ling et al does not teaches that the channel quality estimator is configured to provide the SNR information based upon an average of SNR information over all of the different spatial channels, as claimed.

However, Ling et al teaches that the channel quality estimator is configurable to provide SNR over sub-channels, the sub-channels being a plurality of spatial channels, for transmission

on a reverse link to the transmitter unit (110) (see col. 3, line 66 to col. 4, line34, col. 8, lines 28-31, col. 12, lines 14-23); and teaches that a channel interleaver (116) of the transmitter unit (110) performs interleaving for permitting data to be transmitted based on an average SNR for the sub-channels (see clol. 3, lines 55-60).

Since in Ling et al, the receiver (150) is capable of transmitting information on a reverse link to the transmitter (110), and Ling et al does not teach in detail how the average SNR for the sub-channels is obtained and provided to the transmitter (110), it would have been obvious for one skilled in the art to be able to select to implement Ling et al in such a way that the channel quality estimator is configurable to calculate to obtain an average of the SNR over sub-channels, for providing the average of SNR to the channel interleaver (116) of the transmitter unit (110).

With such the implementation, Ling et al teaches the channel quality estimator is configured to provide SNR information being the average of SNR over all of the spatial channels, or in another word, the channel quality estimator is configured to provide SNR information based upon the average of SNR information over all of the spatial channels, as claimed.

-Regarding claim 13, as similarly applied to claims 11-12, Ling et al does not teaches that the channel quality estimator is configured to provide the SNR information based upon an average of SNR information for pilot signals received over all of the different spatial channels, as claimed.

However, Ling et al teaches that the channel quality estimator is configurable to provide SNR over sub-channels, the sub-channels being a plurality of spatial channels for pilot signals, for transmission on a reverse link to the transmitter unit (110) (see col. 3, line 66 to col. 4, line34,

col. 5, lines 13-18, col. 8, lines 28-31, col. 12, lines 14-23); and teaches that a channel interleaver (116) of the transmitter unit (110) performs interleaving for permitting data to be transmitted based on an average SNR for the sub-channels (see clol. 3, lines 55-60).

Since in Ling et al, the receiver (150) is capable of transmitting information on a reverse link to the transmitter (110), and Ling et al does not teach in detail how the average SNR for the sub-channels is obtained and provided to the transmitter (110), it would have been obvious for one skilled in the art to be able to select to implement Ling et al in such a way that the channel quality estimator is configurable to calculate to obtain an average of the SNR over sub-channels, for providing the average of SNR to the channel interleaver (116) of the transmitter unit (110).

With such the implementation, Ling et al teaches the channel quality estimator is configured to provide SNR information being the average of SNR over all of the spatial channels for pilot signals, or in another word, the channel quality estimator is configured to provide SNR information based upon the average of SNR information for pilot signals received over all of the different spatial channels, as claimed.

-Claim 19 is rejected with similar reasons set forth for claim 11.

-Claim 20 is rejected with similar reasons set forth for claim 12.

-Claim 21 is rejected with similar reasons set forth for claim 13.

-Claim 27 is rejected with similar reasons set forth for claim 11.

-Claim 28 is rejected with similar reasons set forth for claim 12.

-Claim 29 is rejected with similar reasons set forth for claim 13.

Allowable Subject Matter

6. Claims 10, 18 and 26 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments

7. Applicant's arguments filed on 1/7/08 have been fully considered but they are not, in part, persuasive.

-As a result, the previous objections, under Double Patenting, have been withdrawn, since claims 14, 22 and 30 are canceled.

- Applicant's arguments, with respect to claims 9, 17 and 25, are not persuasive. The applicant mainly argues that Ling et al does not teach the feature of estimating characteristics of a plurality of transmission channels used for data transmission.

The examiner respectfully disagrees. As explained above in this Office Action, Ling et al teach a channel quality estimator, (inherently included in the receiver unit (150) (see figure 1)), configured to determine/estimate partial or full-CSI for transmission channels (see col. 18, lines 49-53), and to provide signal-to-noise and interference (SNR) information for one or more of the different spatial channels (see col. 8, lines 27-31), wherein the full-CSI includes sufficient characterization of the propagation path (i.e., amplitude and phase) between all pairs of transmit and receive antennas for each transmission channel "frequency subchannel" used for data transmission, and the partial-CSI includes the SNR for the spatial channels (see col. 17, lines 4-8), the SNR being link characteristics of the transmission channels (see col. 1, lines 34-37, col. 6, lines 45-50). The full-CSI or the partial-CSI, therefore, can be considered here as characteristics

of a plurality of transmission channels used for data transmission. Or in another word, it can be said that Ling et al teaches the feature of estimating characteristics of a plurality of transmission channels used for data transmission, as claimed.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Phuong Phu whose telephone number is 571-272-3009. The examiner can normally be reached on M-F (8:00 AM - 4:30 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chieh Fan can be reached on 571-272-3042. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

PHUONG PHU
PRIMARY EXAMINER

Phuong Phu
01/30/08

Phuong Phu
Primary Examiner
Art Unit 2611